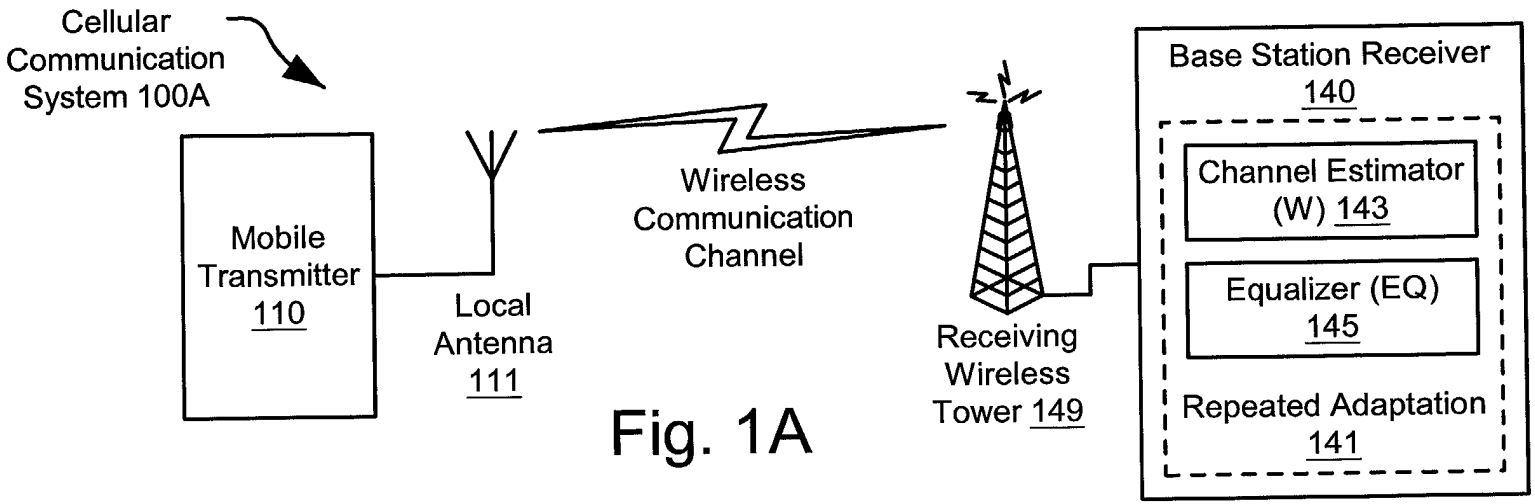
Cellular Communication System 100A
Mobile Transmitter 110
Local Antenna 111
Wireless Communication Channel
Receiving Wireless Tower 149
Base Station Receiver 140
Channel Estimator (W) 143
Equalizer (EQ) 145
Repeated Adaptation 141

Fig. 1A

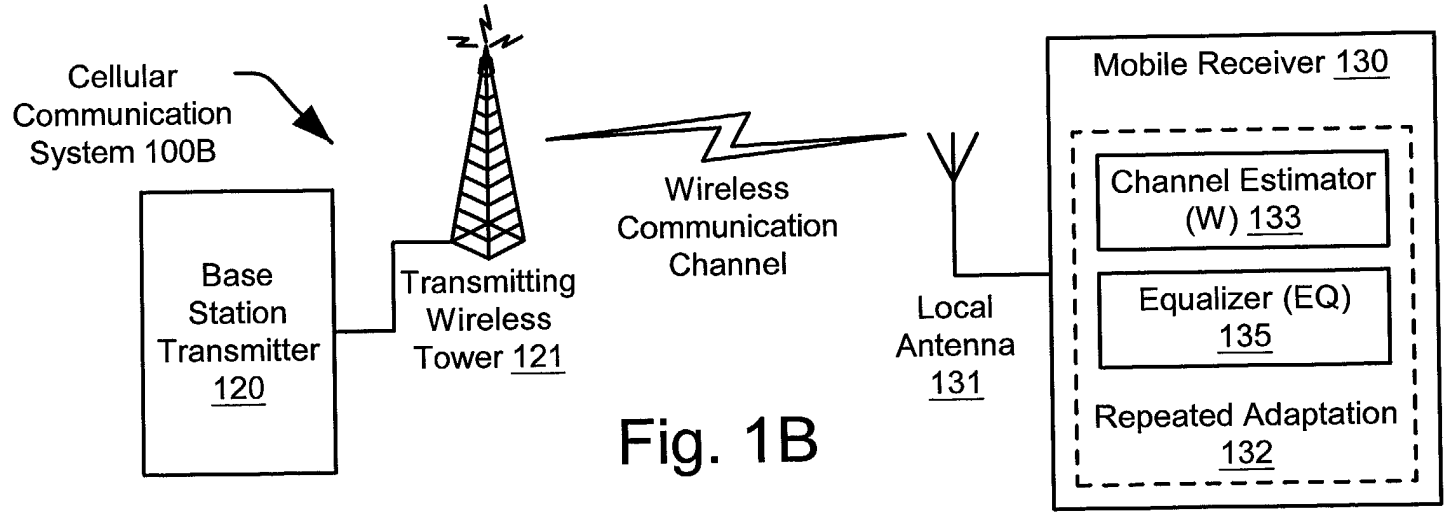
Cellular Communication System 100B
Base Station Transmitter 120
Transmitting Wireless Tower 121
Wireless Communication Channel
Local Antenna 131
Mobile Receiver 130
Channel Estimator (W) 133
Equalizer (EQ) 135
Repeated Adaptation 132

Fig. 1B

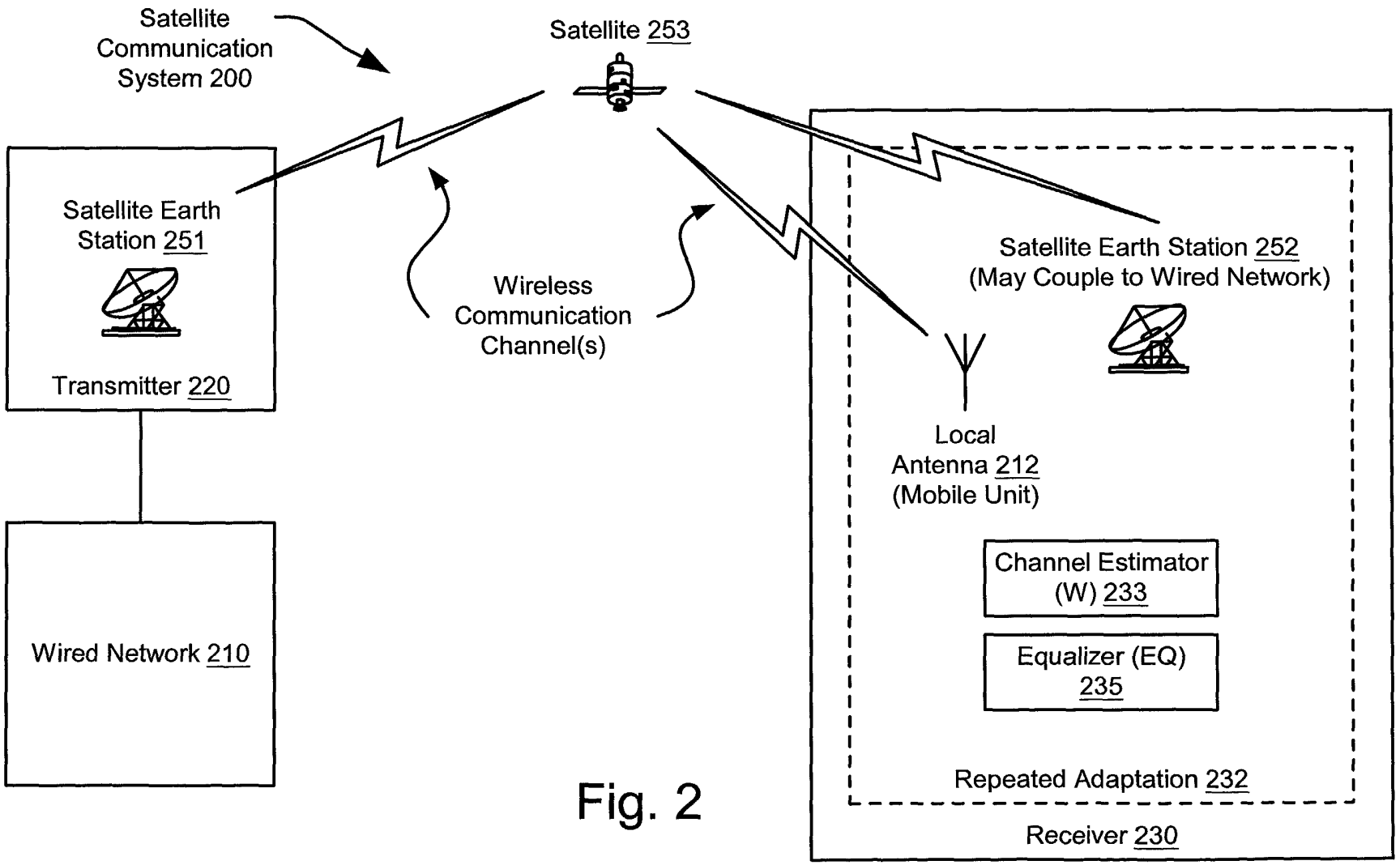
Satellite Communication System 200
Satellite 253
Satellite Earth Station 251
Transmitter 220
Wireless Communication Channel(s)
Satellite Earth Station 252 (May Couple to Wired Network)
Local Antenna 212 (Mobile Unit)
Channel Estimator (W) 233
Equalizer (EQ) 235
Repeated Adaptation 232
Receiver 230
Wired Network 210

Fig. 2

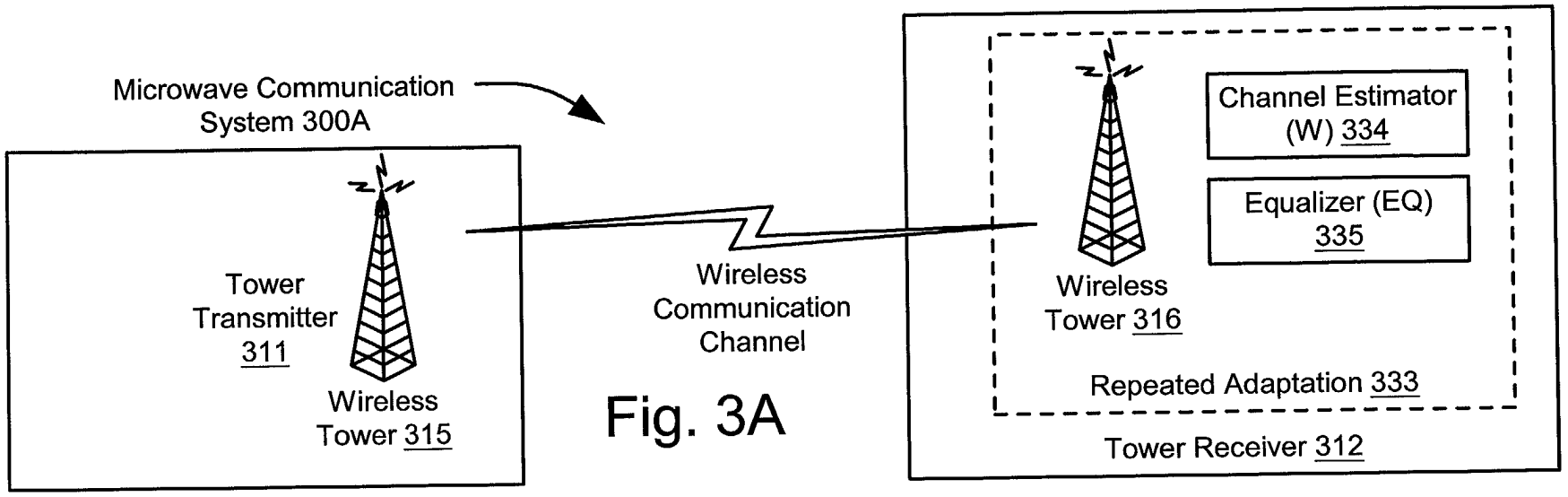
Microwave Communication System 300A
Tower Transmitter 311
Wireless Tower 315
Wireless Communication Channel
Channel Estimator (W) 334
Equalizer (EQ) 335
Wireless Tower 316
Repeated Adaptation 333
Tower Receiver 312

Fig. 3A

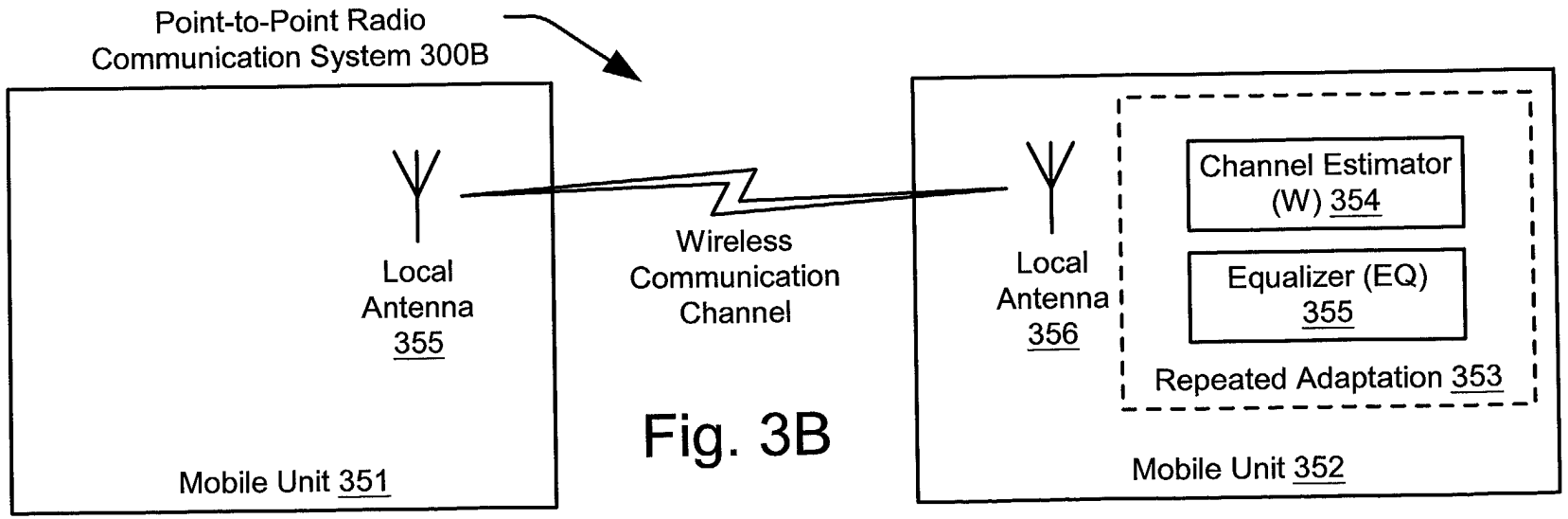
Point-to-Point Radio Communication System 300B
Local Antenna 355
Mobile Unit 351
Wireless Communication Channel
Local Antenna 356
Channel Estimator (W) 354
Equalizer (EQ) 355
Repeated Adaptation 353
Mobile Unit 352

Fig. 3B

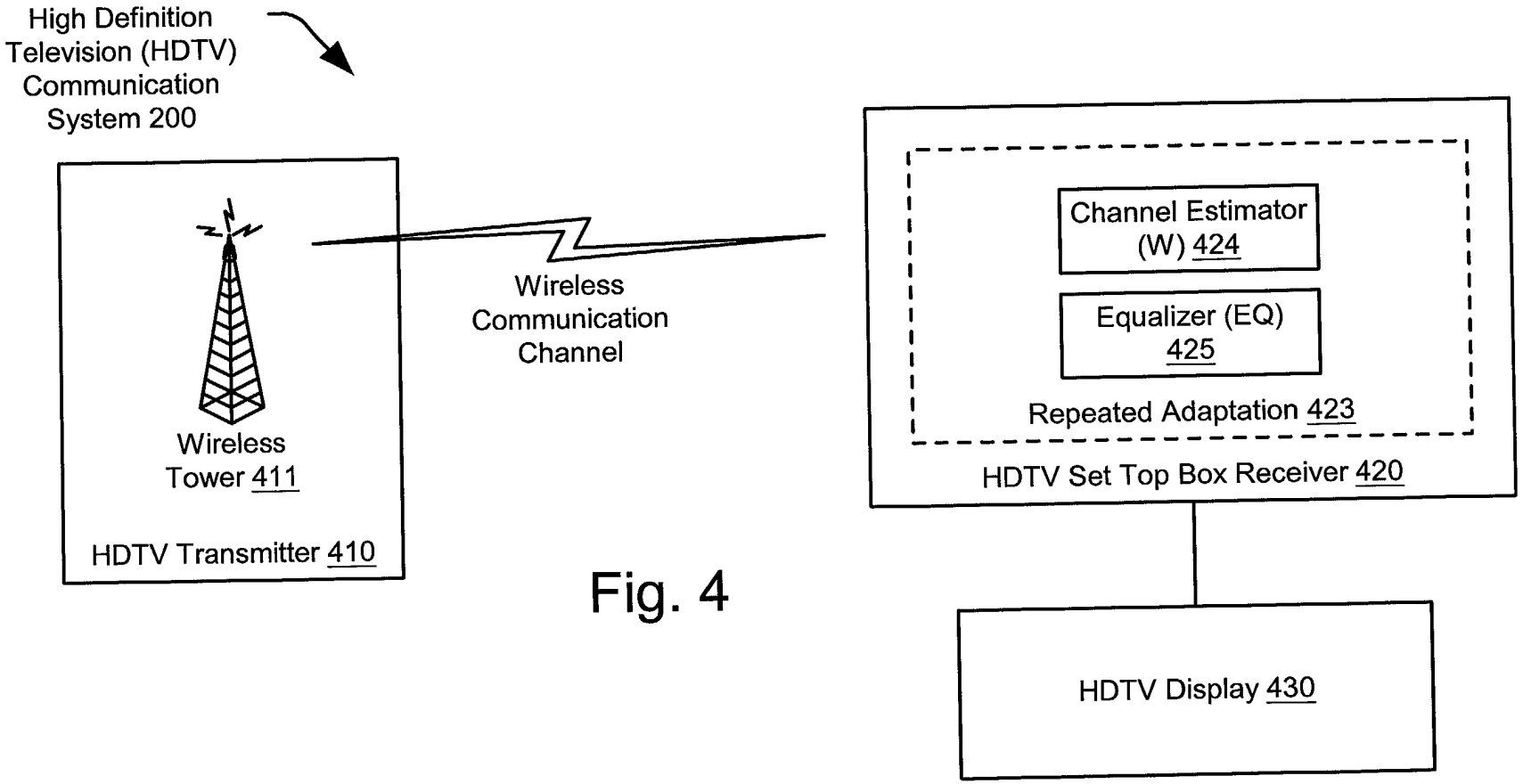
High Definition Television (HDTV) Communication System 200
Wireless Tower 411
HDTV Transmitter 410
Wireless Communication Channel
Channel Estimator (W) 424
Equalizer (EQ) 425
Repeated Adaptation 423
HDTV Set Top Box Receiver 420
HDTV Display 430

Fig. 4

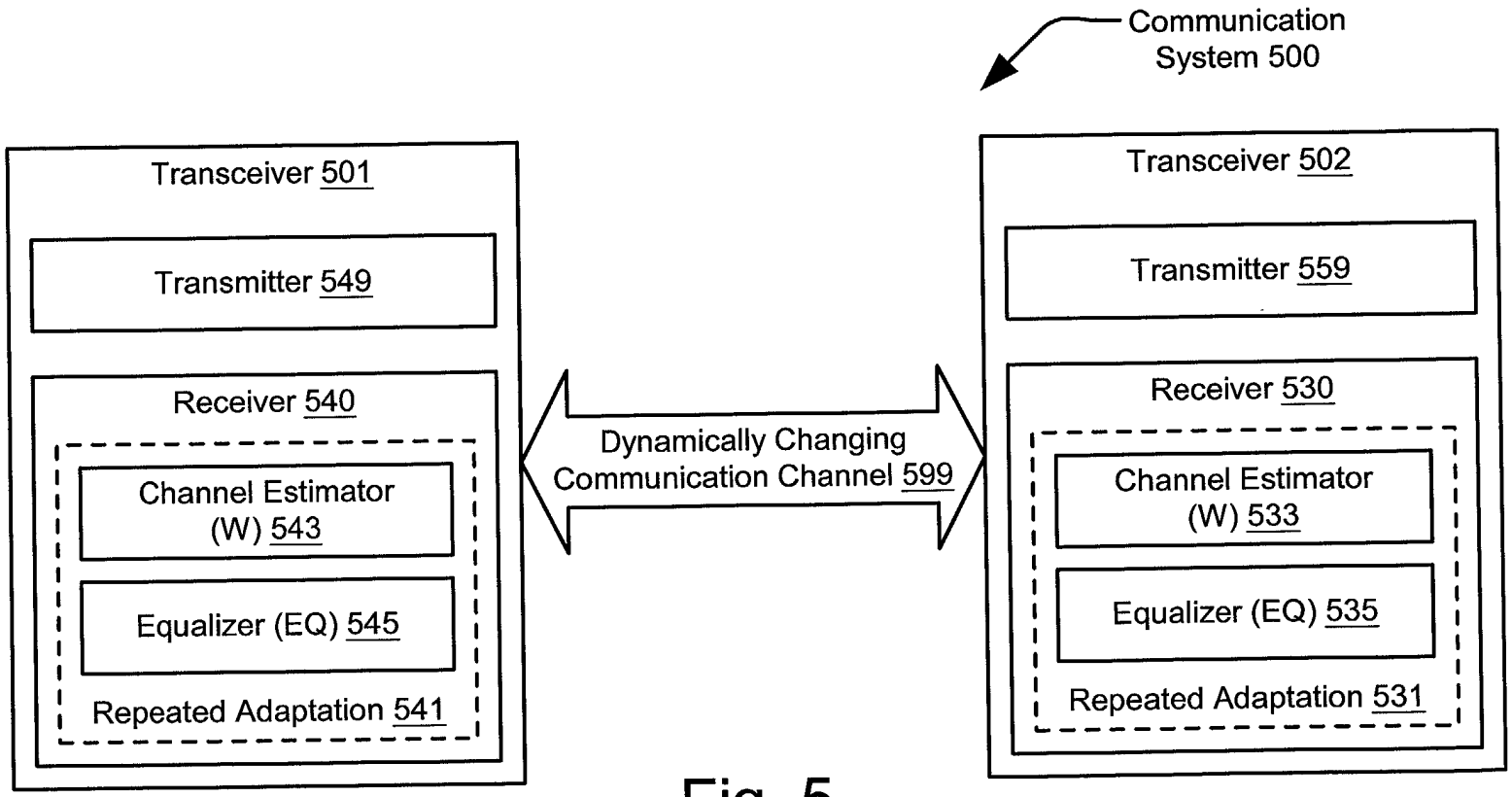
Communication System 500
Transceiver 501
Transmitter 549
Receiver 540
Channel Estimator (W) 543
Equalizer (EQ) 545
Repeated Adaptation 541
Dynamically Changing Communication Channel 599
Transceiver 502
Transmitter 559
Receiver 530
Channel Estimator (W) 533
Equalizer (EQ) 535
Repeated Adaptation 531

Fig. 5

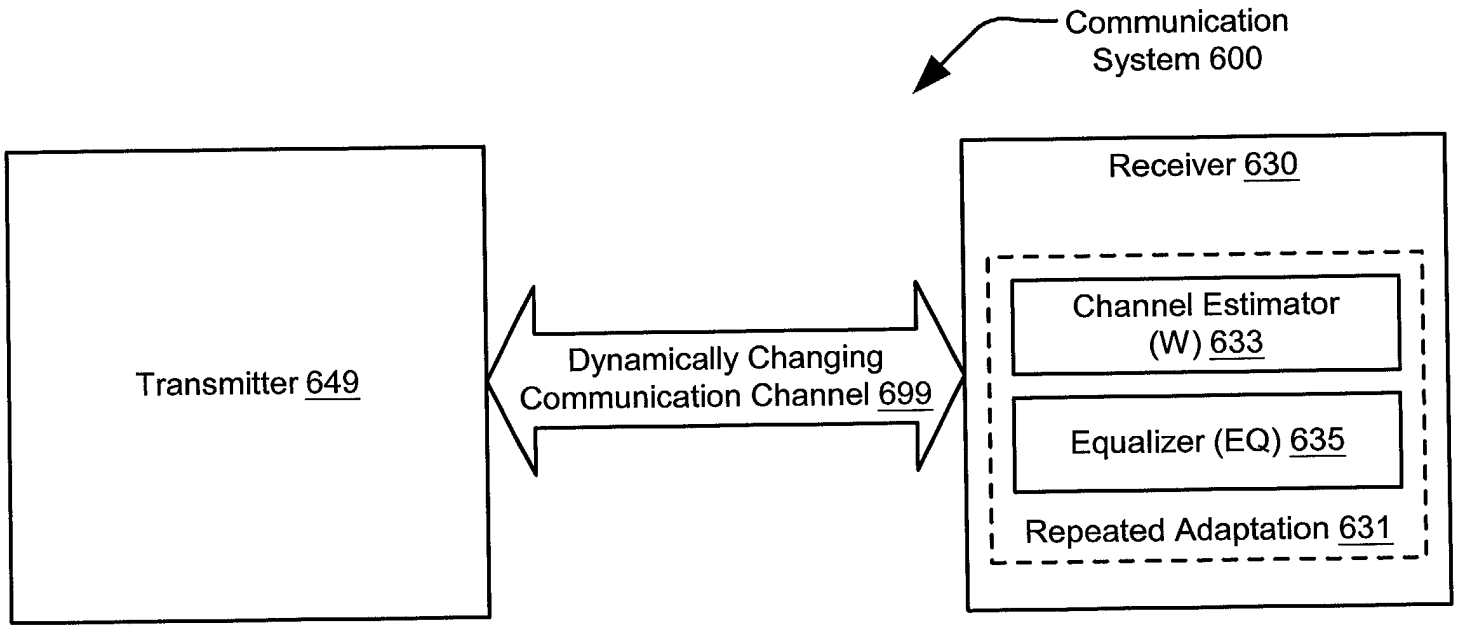
Communication System 600
Receiver 630
Channel Estimator (W) 633
Equalizer (EQ) 635
Repeated Adaptation 631
Transmitter 649
Dynamically Changing Communication Channel 699

Fig. 6

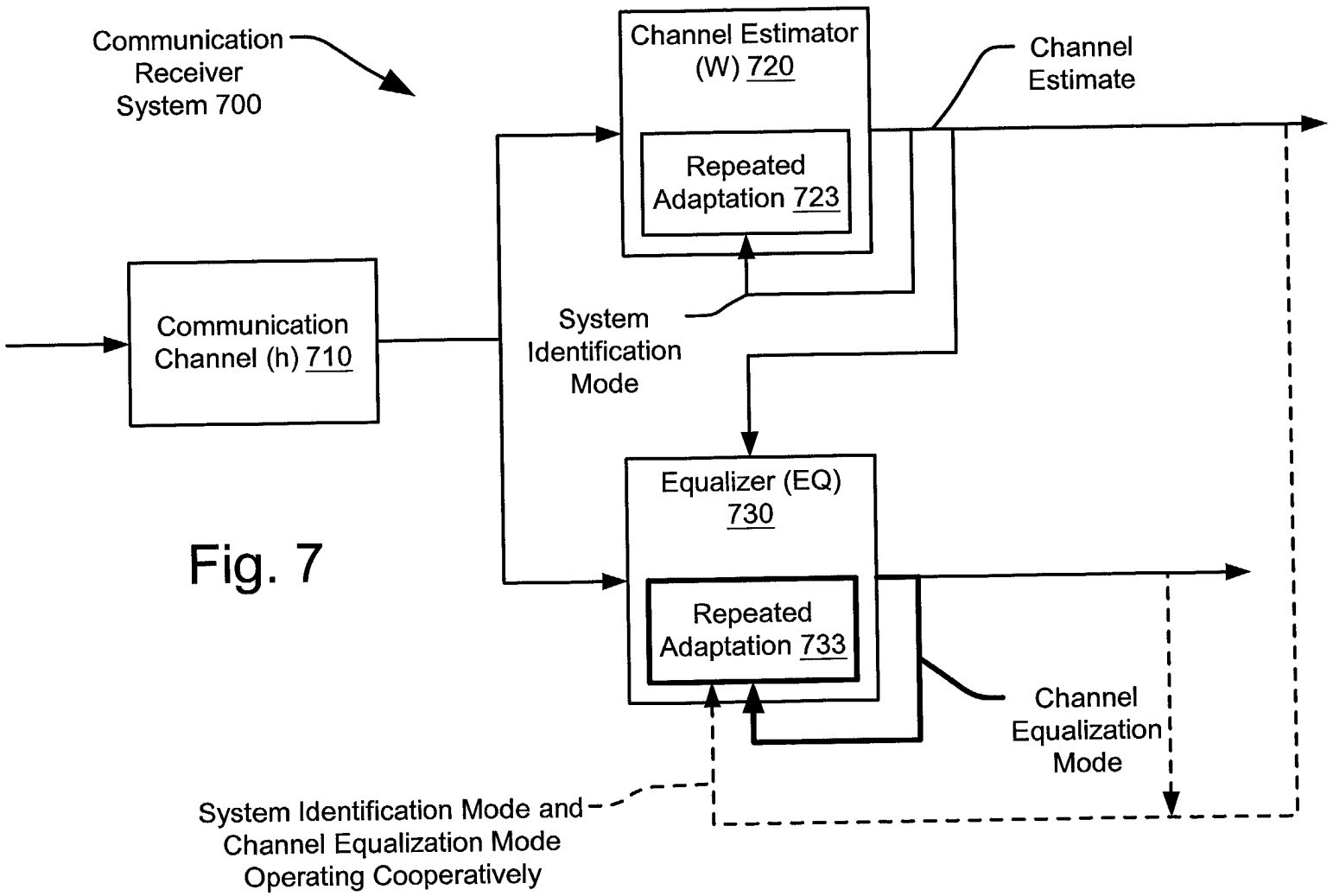
Communication Receiver System 700
Channel Estimator (W) 720
Repeated Adaptation 723
Channel Estimate
Communication Channel (h) 710
System Identification Mode
Equalizer (EQ) 730
Repeated Adaptation 733
Channel Equalization Mode
System Identification Mode and Channel Equalization Mode Operating Cooperatively

Fig. 7

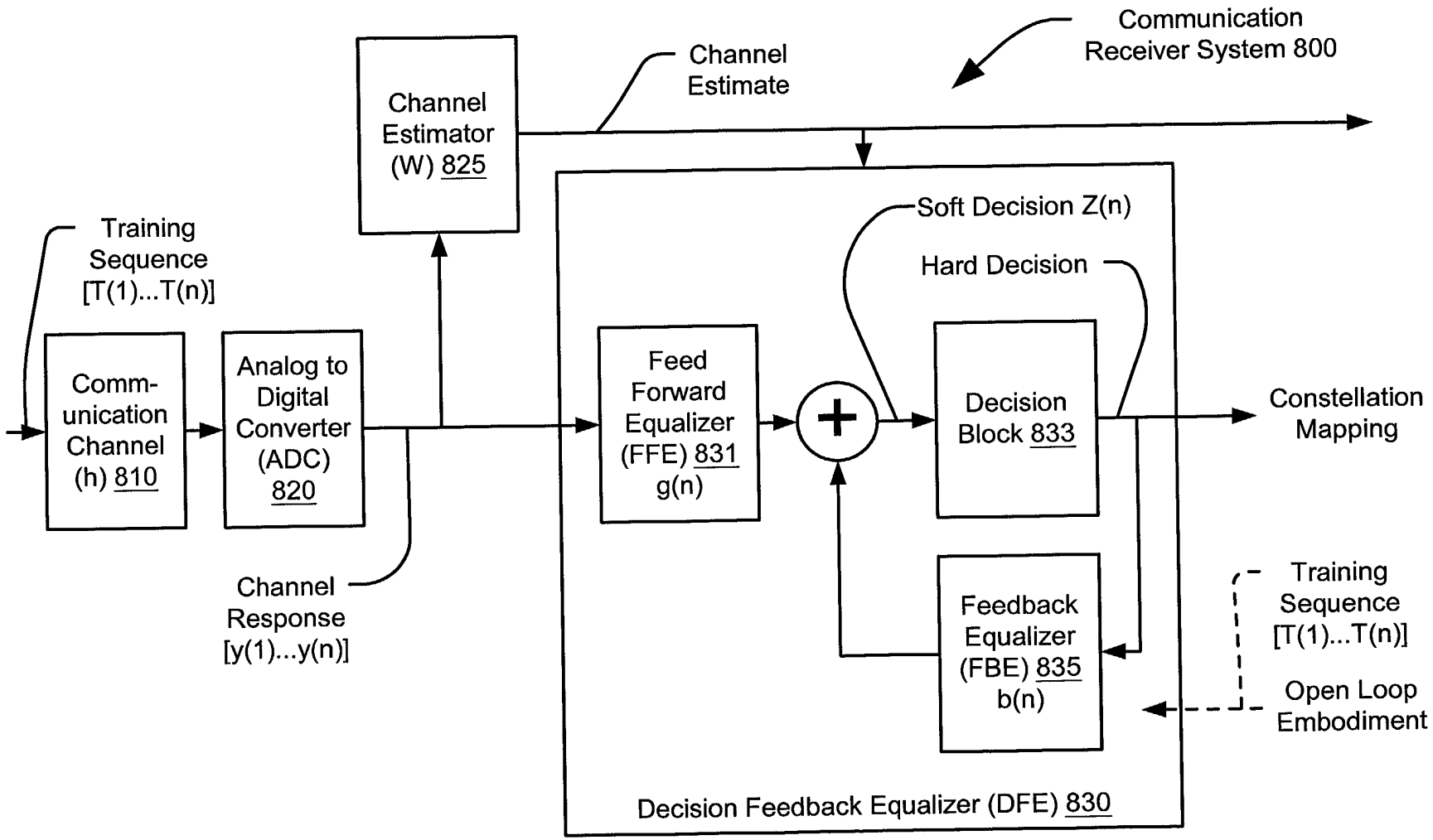
Communication Receiver System 800
Channel Estimate
Channel Estimator (W) 825
Training Sequence [T(1)...T(n)]
Soft Decision Z(n)
Hard Decision
Comm-unication Channel (h) 810
Analog to Digital Converter (ADC) 820
Feed Forward Equalizer (FFE) 831 g(n)
Decision Block 833
Constellation Mapping
Channel Response [y(1)...y(n)]
Feedback Equalizer (FBE) 835 b(n)
Training Sequence [T(1)...T(n)]
Open Loop Embodiment
Decision Feedback Equalizer (DFE) 830

Fig. 8

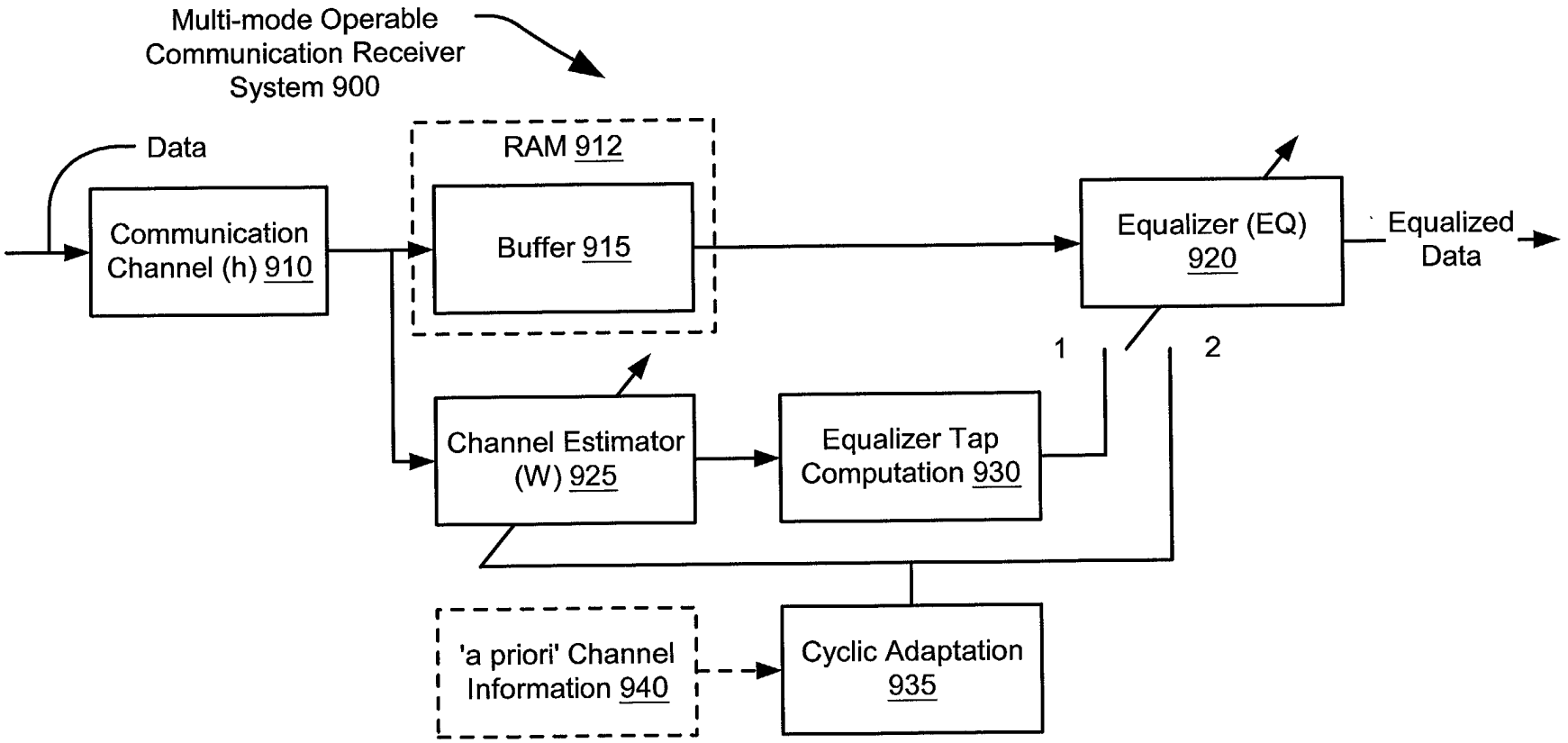
Multi-mode Operable
Communication Receiver
System 900
Data
RAM 912
Communication
Channel (h) 910
Buffer 915
Equalizer (EQ)
920
Equalized
Data
1
2
Channel Estimator
(W) 925
Equalizer Tap
Computation 930
'a priori' Channel
Information 940
Cyclic Adaptation
935

Fig. 9

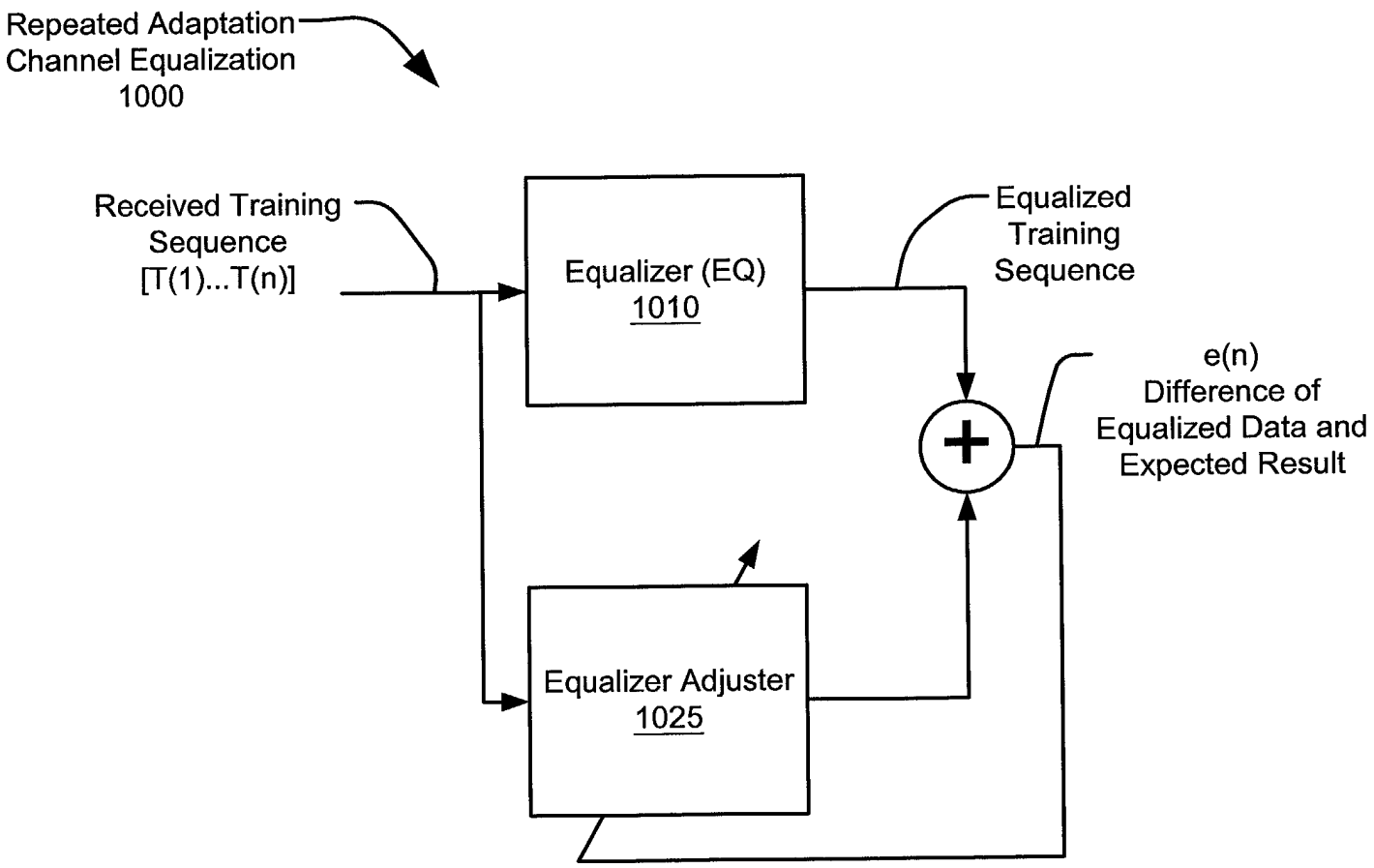
Repeated Adaptation
Channel Equalization
1000
Received Training
Sequence
[T(1)...T(n)]
Equalizer (EQ)
1010
Equalized
Training
Sequence
e(n)
Difference of
Equalized Data and
Expected Result
Equalizer Adjuster
1025

Fig. 10

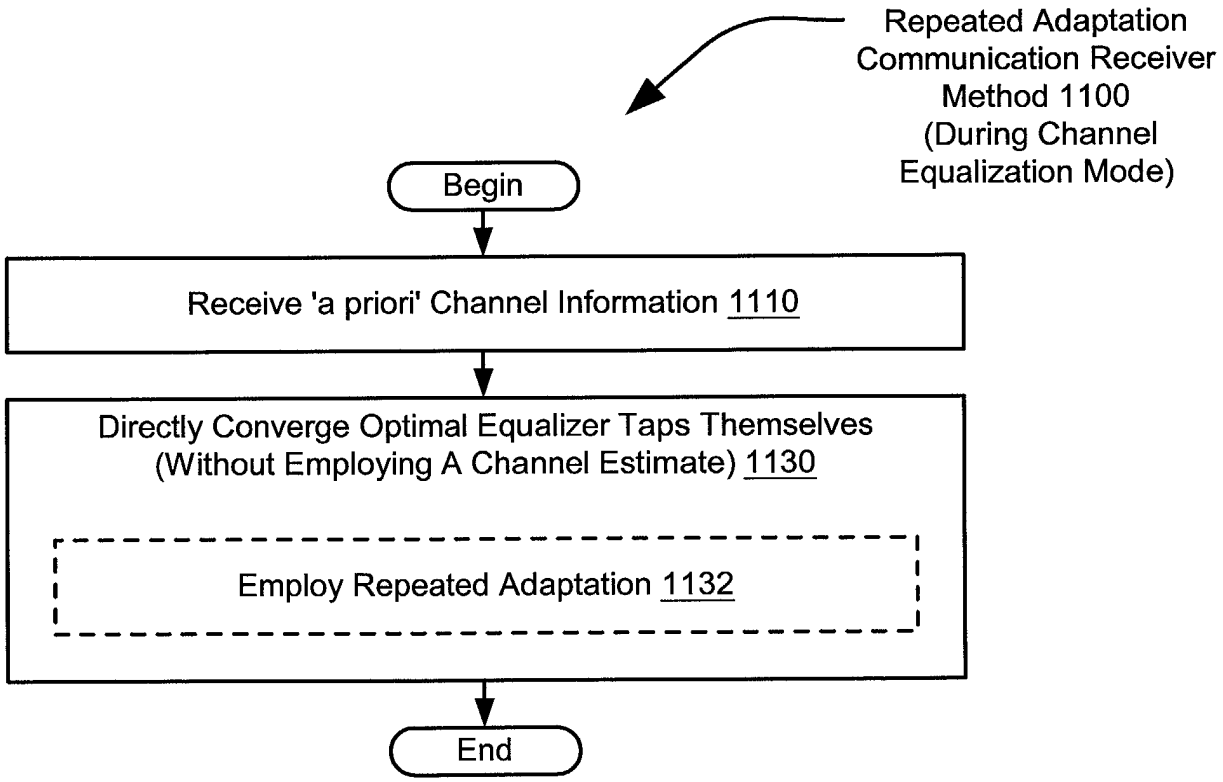
Repeated Adaptation Communication Receiver Method 1100 (During Channel Equalization Mode)
Begin
Receive 'a priori' Channel Information 1110
Directly Converge Optimal Equalizer Taps Themselves (Without Employing A Channel Estimate) 1130
Employ Repeated Adaptation 1132
End

Fig. 11

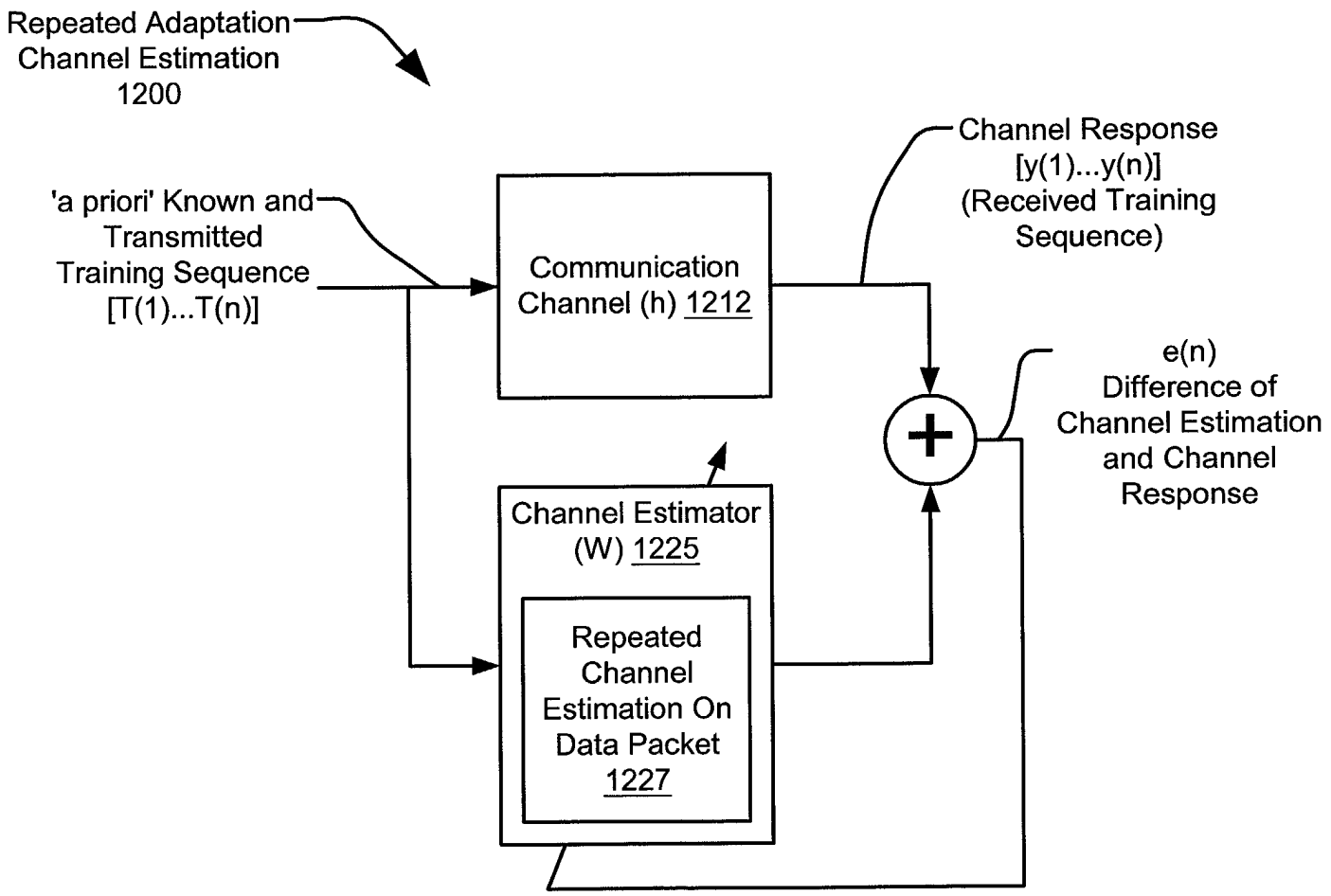
Repeated Adaptation Channel Estimation 1200
'a priori' Known and Transmitted Training Sequence [T(1)...T(n)]
Communication Channel (h) 1212
Channel Response [y(1)...y(n)] (Received Training Sequence)
e(n) Difference of Channel Estimation and Channel Response
Channel Estimator (W) 1225
Repeated Channel Estimation On Data Packet 1227

Fig. 12

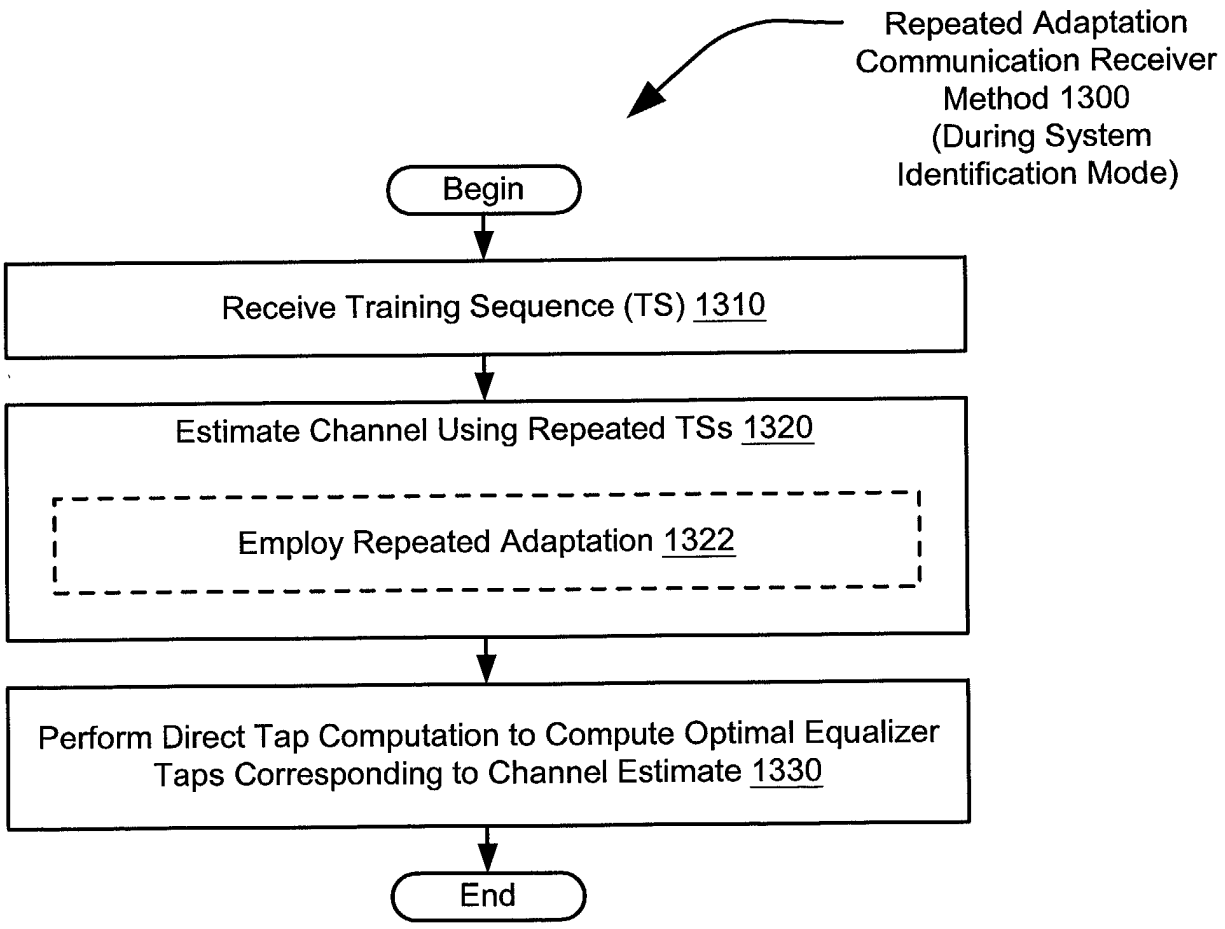
Repeated Adaptation Communication Receiver Method 1300 (During System Identification Mode)
Begin
Receive Training Sequence (TS) 1310
Estimate Channel Using Repeated TSs 1320
Employ Repeated Adaptation 1322
Perform Direct Tap Computation to Compute Optimal Equalizer Taps Corresponding to Channel Estimate 1330
End

Fig. 13

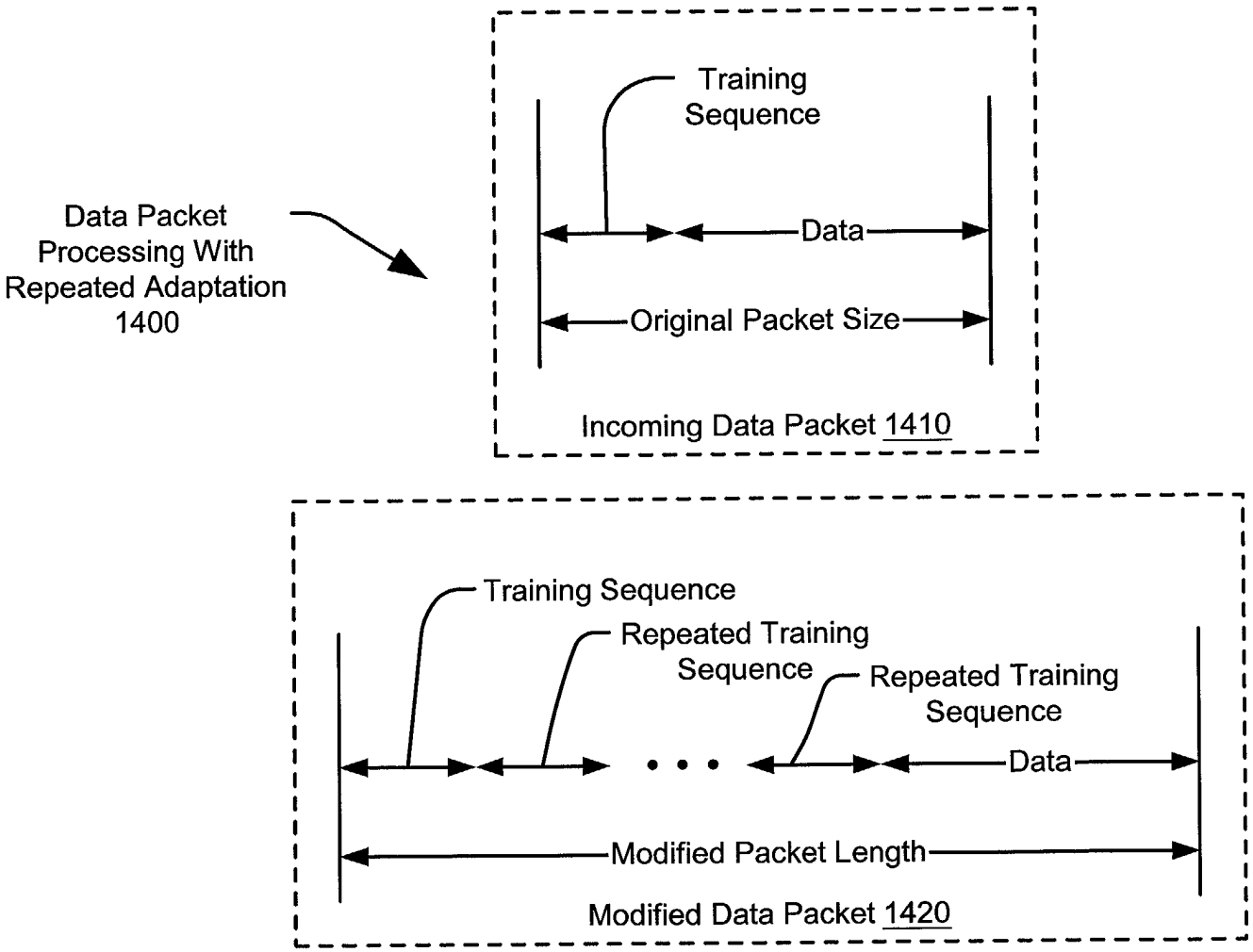
Data Packet Processing With Repeated Adaptation 1400
Training Sequence
Data
Original Packet Size
Incoming Data Packet 1410
Training Sequence
Repeated Training Sequence
Repeated Training Sequence
Data
Modified Packet Length
Modified Data Packet 1420

Fig. 14

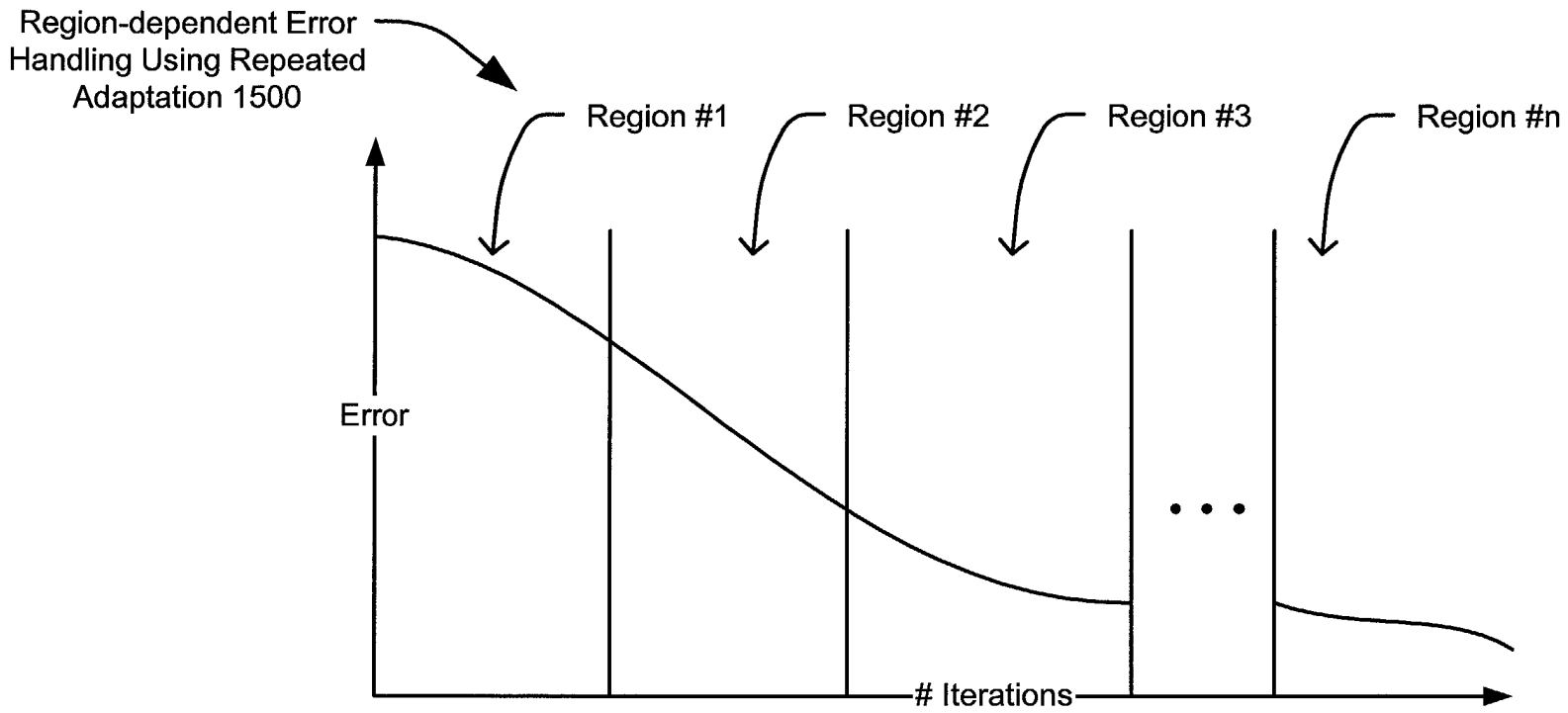

Table (Programmable For Region Processing)

Region	# Iterations	Step Size	Threshold
1	K1	S1	T1
2	K2	S2 < S1	None
3	K3	S3 < S2	T2
⋮			
n	Kn	Sn	Tn

Fig. 15

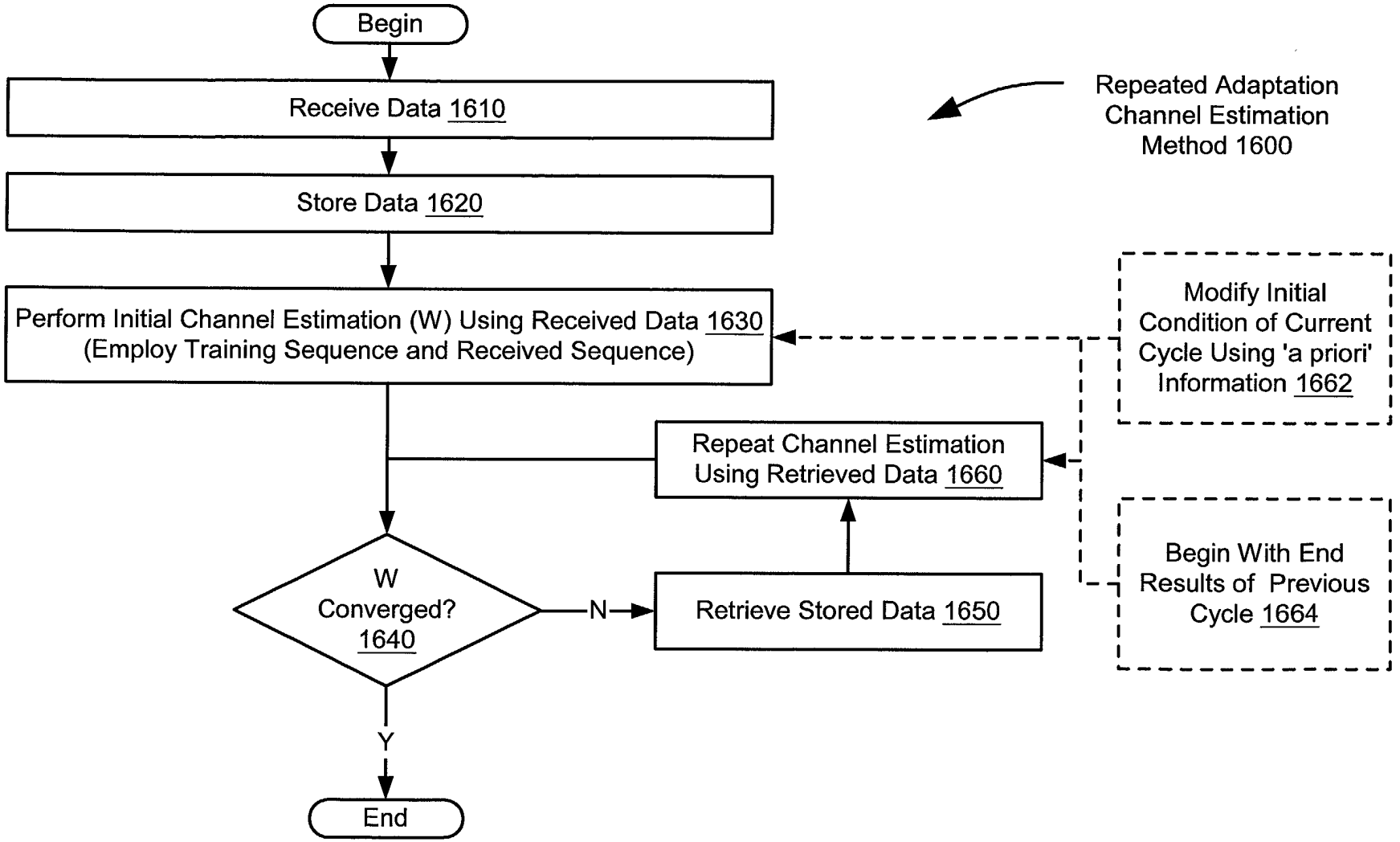
Begin
Receive Data 1610
Store Data 1620
Perform Initial Channel Estimation (W) Using Received Data 1630
(Employ Training Sequence and Received Sequence)
W
Converged?
1640
N
Y
End
Repeat Channel Estimation
Using Retrieved Data 1660
Retrieve Stored Data 1650
Repeated Adaptation
Channel Estimation
Method 1600
Modify Initial
Condition of Current
Cycle Using 'a priori'
Information 1662
Begin With End
Results of Previous
Cycle 1664

Fig. 16

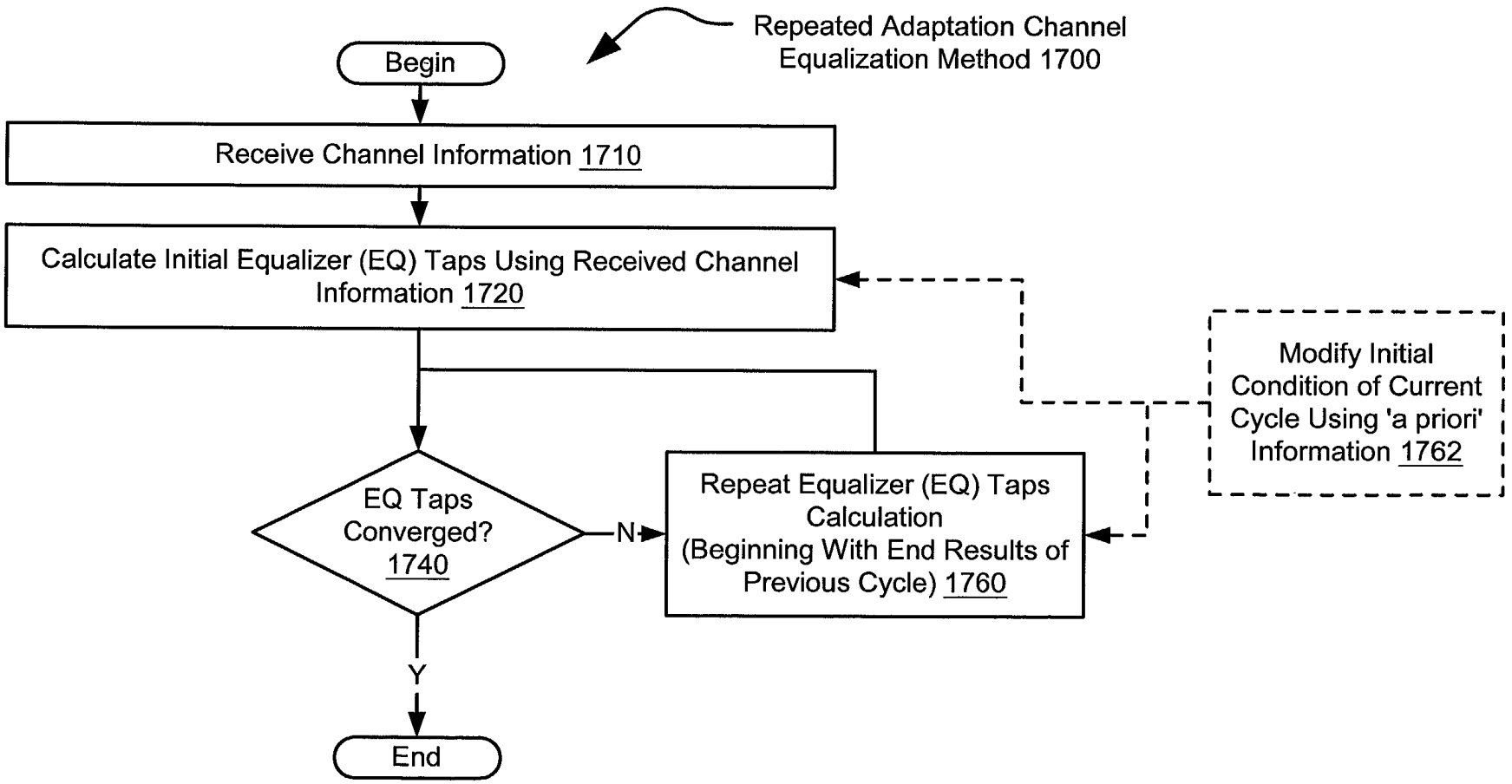
Repeated Adaptation Channel Equalization Method 1700
Begin
Receive Channel Information 1710
Calculate Initial Equalizer (EQ) Taps Using Received Channel Information 1720
Modify Initial Condition of Current Cycle Using 'a priori' Information 1762
EQ Taps Converged? 1740
N
Repeat Equalizer (EQ) Taps Calculation (Beginning With End Results of Previous Cycle) 1760
Y
End

Fig. 17

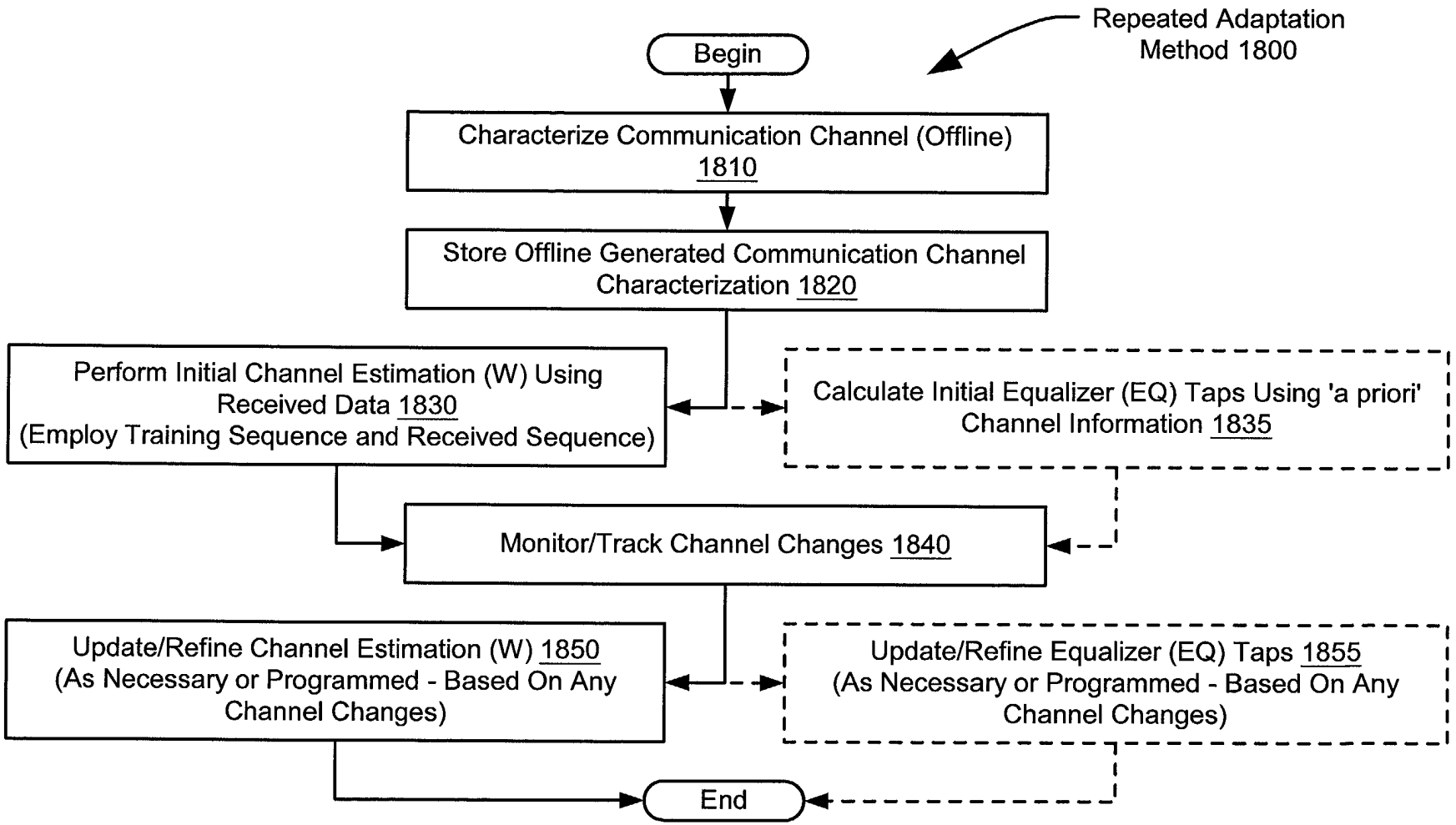
Repeated Adaptation Method 1800
Begin
Characterize Communication Channel (Offline) 1810
Store Offline Generated Communication Channel Characterization 1820
Perform Initial Channel Estimation (W) Using Received Data 1830 (Employ Training Sequence and Received Sequence)
Calculate Initial Equalizer (EQ) Taps Using 'a priori' Channel Information 1835
Monitor/Track Channel Changes 1840
Update/Refine Channel Estimation (W) 1850 (As Necessary or Programmed - Based On Any Channel Changes)
Update/Refine Equalizer (EQ) Taps 1855 (As Necessary or Programmed - Based On Any Channel Changes)
End

Fig. 18